

# Rutland 504 Windcharger (12 v)

## Owners Manual

### Installation and Operation



# Contents

<b>Introduction</b>	<b>Page</b>
Congratulations.....	3
Summary of Features and Uses.....	3
Profile and Dimensions.....	3
General Guidelines and Warnings.....	4
Rutland 504 Layout as Supplied.....	5
Other Items.....	5
 <b>Installation</b>	
Twelve Step Quick Start Guide.....	6
Tail and Nose Assembly.....	7
Tower Preparation.....	7
 <b>Siting The Windcharger</b>	
General Considerations.....	8
On Board Systems.....	9
Land Based Systems.....	11
 <b>Further System Requirements</b>	
Batteries.....	12
Cable Specification.....	12
Assembly of In-Line Fuse Holder.....	13
Charge Regulators and Wiring Schemes.....	14
 <b>Up and Running</b>	
Four Point Final Checklist.....	15
 <b>Specification and Performance</b>	
Guideline Performance Curve.....	15
 <b>Maintenance and Troubleshooting</b>	
Inspection and Maintenance.....	16
Troubleshooting.....	17
 <b>For Your Records</b>	
Purchase Information.....	19
Limited Warranty.....	20

## Introduction

Congratulations and thank you for purchasing Marlec's Rutland 504 Windcharger. This is the latest technology for charging batteries in remote locations and is a development from the successful Rutland 503.

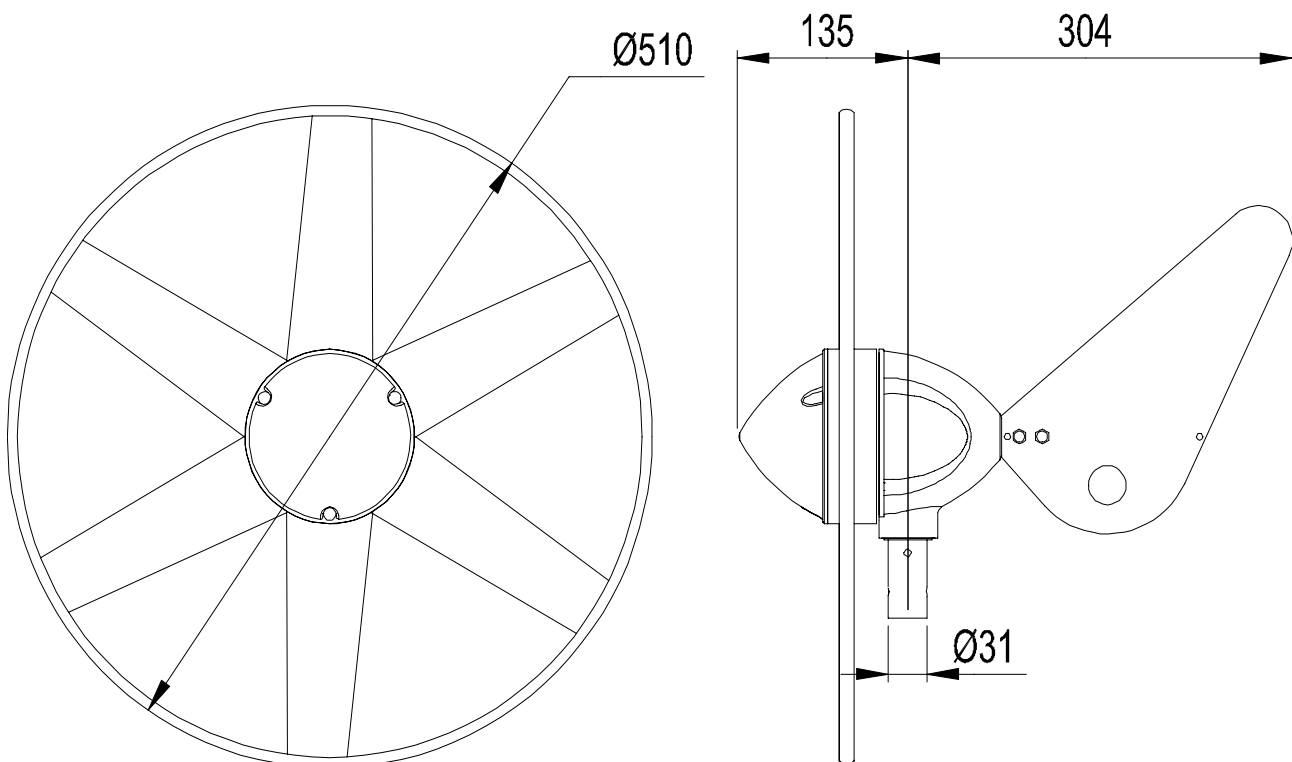
It is strongly recommended that you read this manual and familiarise yourself with its contents before installing and operating the Windcharger system.

## Summary of Features and Uses

- Aerodynamically styled to maintain good wind flow to the turbine
- Long tail fin to maintain good orientation and stability in the wind
- High grade construction materials for durability with excellent UV stability
- Low wind speed start up turbine with "safety" halo
- Provides a DC power supply to charge 12V battery bank
- Designed for use on sailing yachts up to 10m & temporary/portable installations for camping, caravans and motorhomes

Note : There are other Rutland Windchargers designed for permanent installations on land -contact Marlec or visit [www.marlec.co.uk](http://www.marlec.co.uk) to find out more

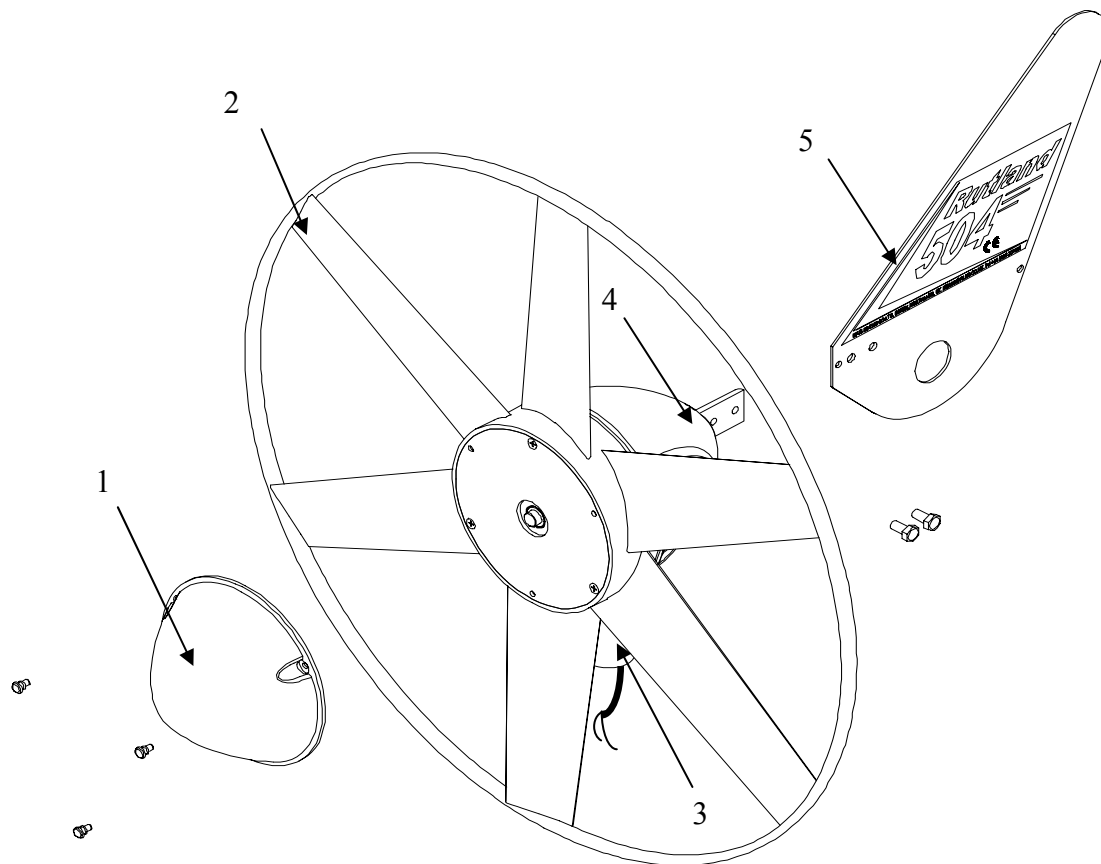
## Rutland 504 Profile & Dimensions



## General Guidelines and Warnings

- *Mounting pole outside diameter MUST NOT exceed 38.1mm for at least the top 0.5m. Larger section poles must not be used as this will reduce the tower to blade clearance. In high wind conditions this could cause damage to the windcharger by allowing the blade to come into contact with the mounting pole. A broken blade or rim will cause turbine imbalance with consequent damage.*
- *When turning, the Wind charger is capable of generating voltages in excess of the nominal voltage. The turbine must never be allowed to rotate unless it is electrically connected to a regulator or batteries. Avoid applying a short circuit to the Wind charger particularly in high winds. If a short circuit is necessary first slow the turbine as described below. Caution must be exercised at all times to avoid electric shock.*
- *Stopping the turbine – this may be necessary to undertake battery maintenance. If the regulator has a stop switch, apply this. If possible stopping the turbine should be done in low wind speed conditions. The turbine can be slowed by rotating or orienting the tail fin upwind, this will slow the turbine sufficiently for it to be safely secured to the pole with a rope. Avoid leaving the turbine tied up for any period of time, we recommend that the turbine either be covered or removed and stored in a dry location.*
- *No attempt to repair the system should be made until the wind generator is restrained from turning.*
- *The Wind charger is fitted with ceramic magnets which can be damaged by heavy handling. The main generator assembly should be treated with care during transit and assembly.*
- *It is essential to observe the correct polarity when connecting the Wind charger and all other components into an electrical circuit. Reverse connection will damage the Wind charger and incorrect installation will invalidate the warranty.*
- *The fuse supplied must be fitted to protect the system unless used in conjunction with a regulator or controller that is already fitted with a charge fuse.*
- *High winds - the Rutland 504 Wind charger is suitable for sailing boats and some land based applications. When storm winds are forecast the turbine can be restrained to prevent possible high wind damage, eg from flying debris. It should be noted that other Rutland Wind charger models namely Furlmatic versions, are specifically designed for use at remote land based locations and are normally recommended. Note that where the manufacturer recommends a furling type windcharger should have been used the warranty is invalidated in cases of storm damage.*
- *If in doubt, refer to your dealer, a competent electrical engineer or the manufacturer.*

## Rutland 504 Layout As Supplied



1. Nose Cone with 3 x snap rivets
2. Safety Turbine - *The blades incorporating the outer ring must not be tampered with or altered.*
3. Post Adaptor Assembly - *This fits into a pole of 31.7mm internal diameter and NO MORE THAN 38.1mm external diameter.*
4. Nacelle containing Windshaft Assembly.
5. Tail Fin Assembly with 2 x M6 x 10 Hex. Head screws, spring washers and plain washers.

## Other Items

### Check that you have also received :-

- 1 x in line fuse holder and fuse
- 1 x two way terminal block
- 1 x 5 mm Allen key
- 2 x M8 x 16 Button cap screws and shakeproof washers ( for pole mounting )

### Tools that you will need :-

- Suitable wire stripper
- Small terminal screwdriver
- 10 mm spanner or socket

### Other items you will need :-

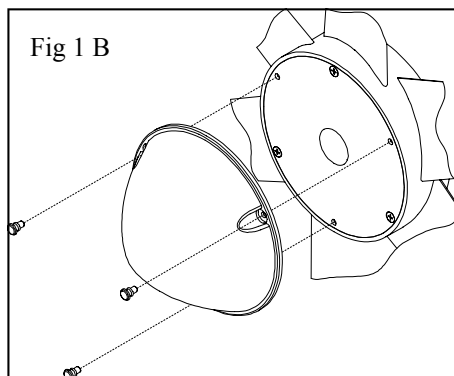
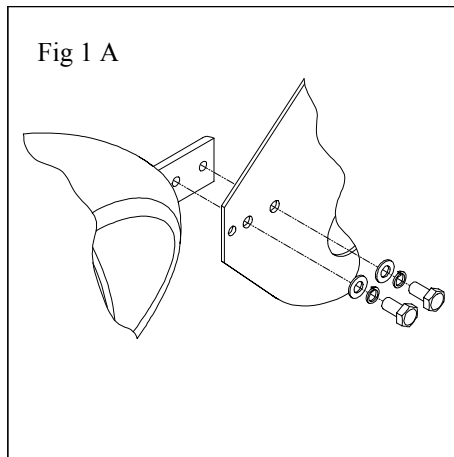
- mounting tower / pole and stays
- batteries and battery terminals
- connector blocks
- charge regulator from Marlec range

### Other items you may include :-

- ammeter
- voltmeter

## Twelve Step Quick Start Guide

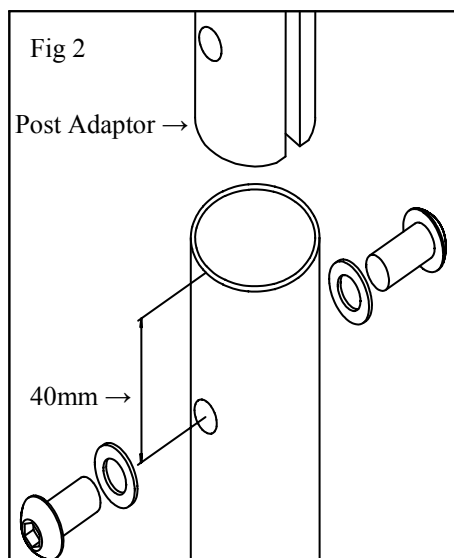
1. Choose an open site to expose the Wind charger to a clear flow of wind and avoiding obstructions. On board mount the Wind charger at least 2 metres above the deck and on land at least 4 - 6 m high. *Read the full section on Siting the Wind charger.*
2. Choose a mounting pole with an internal diameter of 31.7 mm and external diameter of no greater than 38.1 mm for the top 0.5 m to (i) prevent accidental damage and (ii) meet warranty conditions.
3. Mount a charge regulator, from the Marlec range, to a suitable vertical surface and close to the battery. Follow the instructions supplied with the charge regulator.
4. Drill the mounting pole, if required, in preparation to accept and secure the Wind charger. *See Assembly and Installation section.*
5. Choose suitable two core cable to connect from the Wind charger to the regulator. Up to 20 m this should be of at least 2.5 square-mm cross sectional area. A short section of 4 square-mm cross sectional area is required to link the regulator to the battery. *For other distances see the table in Cable Specifications.*
6. Position the mounting pole ( *this may be done on the ground before raising the pole* ) so that the selected cable can be threaded along it.
7. Fit the tail and nose to the Wind charger using fasteners provided.
8. Join the cable threaded through the pole to the Wind charger output cable using the connector block provided or a latching plug and socket. *We recommend looping back the cable and securing with a cable tie to provide strain relief to the joint.*
9. Carefully push the cables down the pole whilst sliding the post adaptor down the pole. Line up the holes and secure in place with the screws and washers provided. Tighten with the Allen key. **Do not allow the turbine to spin in the wind.**
10. Locate the charge regulator close to the battery and carefully follow ALL the regulator guidelines and installation sequences for connecting the Wind charger through to the battery. *Note : Install the in-line fuse supplied with the Wind charger ONLY if the regulator selected does not include a fuse.*
11. Ensure that the battery connections are permanent as the Wind charger should NEVER be operated without a connection to the battery.
12. Raise and secure the Wind charger. It can now be allowed to rotate. Follow the “ **Up and Running- Four Points Final Checklist**” featured later. Also the “ **General Guidelines and Warnings**” section expands on the above points.



### Tail & Nose Assembly (Fig.1)

1. Place the generator, nose down, on a flat soft surface.
2. Fit the tail into position on the protruding portion of casting, ensuring the holes in the casting align with the corresponding holes in the tail fin.
3. Secure the Tail fin in position with the 2 M6 screws and washers, ensuring the plain washers are against the tail fin.
4. Check tightness of all screws. (*Do not over-tighten*).
5. Place the nose cone into position aligning the holes and press the snap rivets into the holes to secure.

### Tower Preparation (Fig.2)



1. The post adaptor fitted to the 504 is designed to fit inside a standard 31.7mm internal diameter tube. Max external diameter 38.1mm (1½").
2. Mark and centre-punch two positions diametrically opposite, at 90° to the pipe seam if necessary, 40mm from top of the tube.
3. Drill two holes 8.5mm in diameter on centre-punch positions.

*Note: When using the Rutland 504 Mounting Kits, items 2 and 3 can be ignored, as these are pre-drilled.*

### Marlec Tower Options

- Rutland 504 Marine Mounting Kit **CA-12/01**
- Marine Stays Kit for use with Mount Kit **CA-12/32**
- Rutland 504 Land Tower & Rigging Kit for temporary installations **CA-12/12 & CA-12/13**
- Tube sections to adapt to own pole arrangement — 1000mm **CA-12/15** or 500mm **CA-12/16**

## Siting the Wind charger

### General Considerations

The location and height of the mounting pole or tower for your wind turbine will be the major factor in the overall performance of your system.

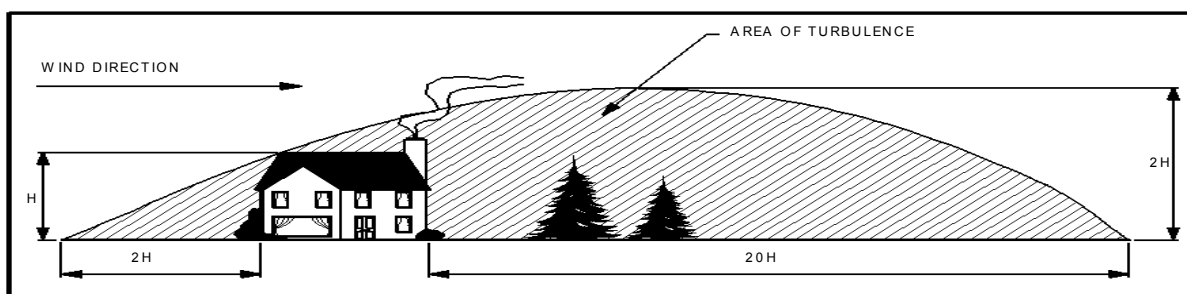
The smooth flow of wind over land and water is often interrupted by a multitude of obstructions causing wind shear and turbulence.

**Wind shear** describes the interference between the fast moving upper air and the slow moving air close to the ground and the resulting decrease in average wind speed as one gets closer to the ground.

**Turbulence** is caused by the wind passing over obstructions such as moored boats, trees and buildings.

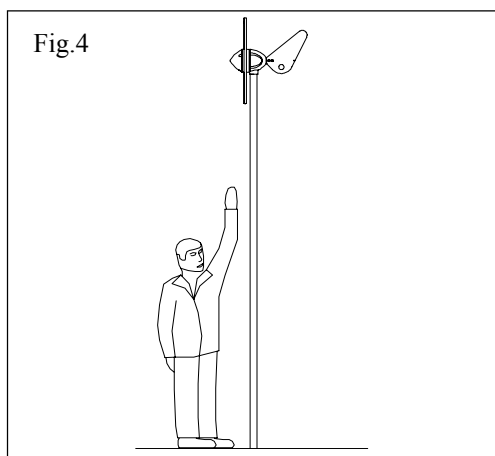
Both wind shear and turbulence diminish with height and can be overcome simply by putting the turbine sufficiently high above them. It is therefore essential that the wind generator should be located in an area as free as possible from disturbed wind flow. Bear in mind that downwind obstructions can be as detrimental to performance as upwind obstructions (Fig.3).

Fig 3



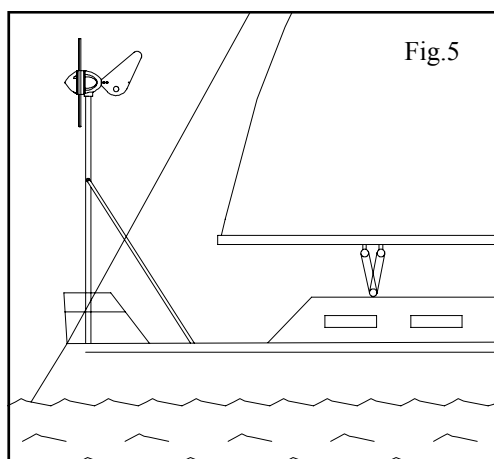


## On Board Systems



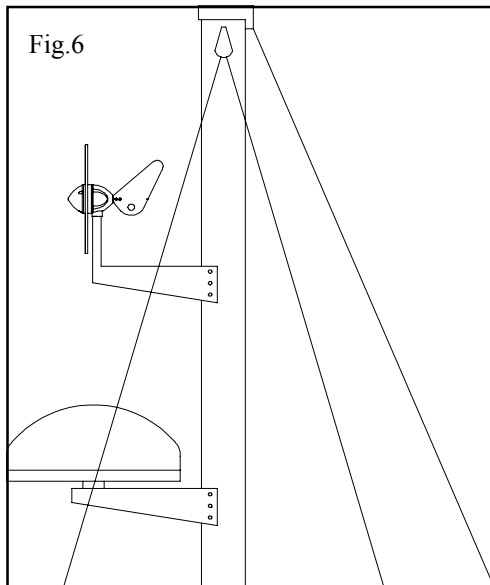
- The wind generator should be mounted at a safe height, a minimum of 2 metres (6.5 feet) above the deck and away from other obstacles which could interfere with the blades or tail assembly (Fig. 4).
- The Rutland 504 is designed to fit inside an aluminium or stainless steel tube with an internal diameter of 31.7mm (1<sup>1</sup>/<sub>4</sub>" ). The external diameter must not exceed 38.1mm (1<sup>1</sup>/<sub>2</sub>" ), see **Warnings!**
- Suitable tube: 1<sup>1</sup>/<sub>2</sub>" 10 SWG aluminium or Stainless Steel 35mm x 1.5mm.
- The Rutland 504 Mounting Kit (Part No: **CA-12/01**) is available for deck mounting or short sections of stainless steel tube of 500mm & 1m pre-drilled are available to adapt to your own fabrication.

The following mountings are suggested according to user installation preference and site conditions:



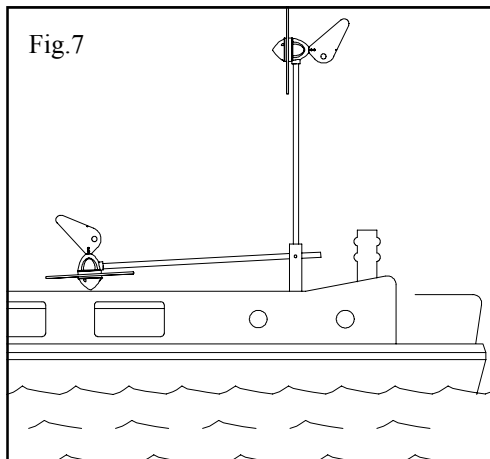
### Pushpit (Fig.5)

A suitable pole mounted to the deck with deck plates and rigid guys is the most popular method of mounting the Wind charger on yachts, e.g. Rutland 504 Marine Mounting Kit **CA-12/01** and Marine Stays Kit **CA-12/32** available from Marlec.



### Mizzen (Fig.6)

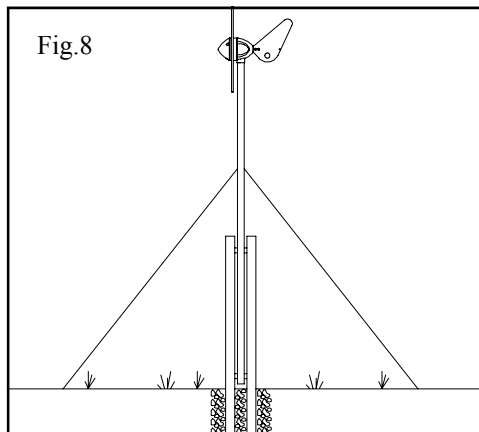
Mizzen mounting is suitable on larger yachts, taking advantage of greater wind flow the higher the wind turbine is mounted.



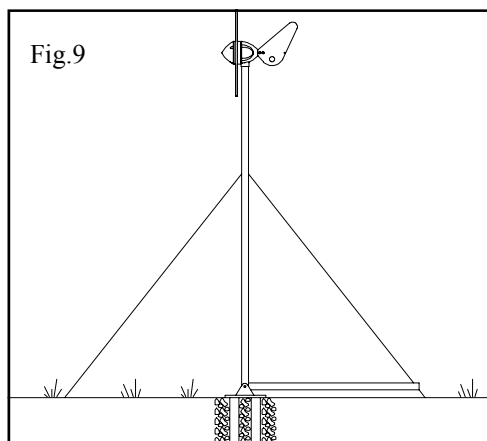
### River Boats (Fig.7)

A pivot pole is ideal for river boats as the Wind charger can easily be raised and lowered.

## Land Based Systems



Centre Pivoted Pole



Base Pivoted Pole

The Rutland 504 is designed to fit inside an aluminium or stainless steel tube with an internal diameter of 31.7mm (1<sup>1</sup>/<sub>4</sub>”). Max external diameter 38.1mm (1<sup>1</sup>/<sub>2</sub>”).

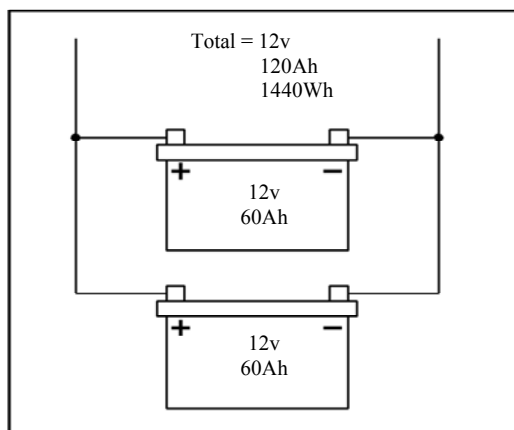
Pivot type towers are recommended as these allow for easier installation and lowering for access to the wind generator. Two forms of pivot tower are suggested in Figs 8 & 9.

A portable Land Tower and Rigging Kit is available from Marlec. Part Nos: **CA-12/12 & CA-12/13**

A suitable mounting pole can be erected using a 6.5 metre (21 feet) length of 50mm (2”) galvanised water pipe adapted down to 31.7mm for a minimum length of 500mm at the top section. The tube must be supported by a minimum of two sets of three guy lines. The attachment points for the guy lines to the tower should be securely fixed to the tower. Follow these guidelines:

- The guy wires should be a minimum of 3mm in diameter.
- The shackles should be a minimum of 5mm in diameter.
- Rigging screws should be a minimum of 5mm in diameter.
- All items should be galvanised or stainless steel for protection against corrosion.
- Where guy lines are looped, the loop must incorporate a thimble and be fitted with a minimum of three rope grips.
- All ground fixings must be made suitable according to the terrain.

## Further System Requirements



Batteries in parallel to increase ampere hours (Fig.10).

*Note : Batteries must not be joined in series as this will increase the voltage*

### Batteries

Leisure/Deep Cycle batteries are specifically designed for good performance in terms of charge/discharge cycles. Batteries are an important part of the renewable energy battery charging system and should be sized according to the load requirements and provide at least 3 days reserve capacity. This will reduce cycling, prolong the life of the battery and ensure system reliability during periods of low wind.

- Permanent connections should always be made to the battery terminals. Never use crocodile clips or similar devices. Battery terminals should be well greased with petroleum jelly or similar.
- We strongly recommend that one of the charge regulators available from Marlec is fitted to prevent batteries becoming overcharged in strong winds and during low energy consumption periods. A regulator is essential where gel and sealed batteries are used.
- Batteries may be linked as shown in the Fig 10. It is essential to observe polarity as follows:

**Red is + Positive    Black is - Negative**

Fig 11	Cable Size		
Cable Run (m)	(mm <sup>2</sup> )	SWG	AWG
0-20	2.5	15	13
21-30	4	13	11
31-45	6	11	9
46-80	10	9	7

### Cable Specification

The cable used for connection of the Wind charger to the batteries should be in accordance with Fig 11. The use of a smaller cable than recommended will reduce the performance of the charging system.

Cable and connectors are available from your dealer or the manufacturer.

## Assembly of the In-Line Fuse Holder

**Note:** It is not necessary to fit the in-line fuse holder and 7.5A fuse if the selected voltage regulator has an integral fuse.

**Each Pack consists of: -**

- |            |                             |
|------------|-----------------------------|
| Item 1 & 2 | One Plastic Holder.         |
| Item 3     | Two Electrical Connections. |
| Item 4     | One Spring.                 |
| Item 5     | One Fuse.                   |

Assemble the fuse into the holder as follows:

1. Select a suitable position to mount the in-line fuse, this should be in the positive lead between the regulator and the battery.
2. Pass the positive wire from the battery through one half of the plastic holder and the positive from the regulator through the other half. (1 & 2) See Fig.12.
3. Place the spring over the cable inside the longer (1) of the two plastic holders. See Fig.12.
4. Bare a small amount of wire from the ends of the cables, twist the copper wire crimp and solder the electrical connections (3) onto the ends.
5. Insert the fuse and twist the two halves of the holder together to complete the electrical circuit. See Fig.13.

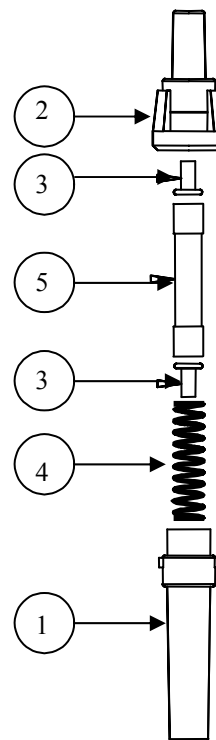


Fig. 12

**Note:** When fully assembled please ensure the electrical connections make direct contact with the fuse.

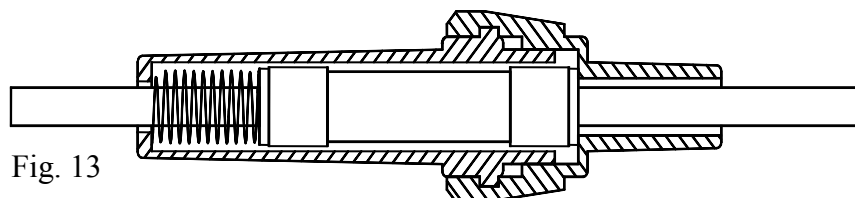
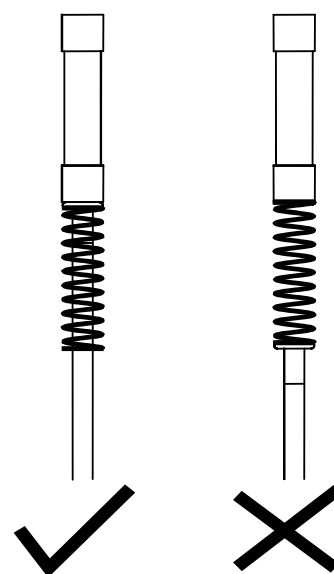


Fig. 13



## Rutland 504 Wiring Schemes

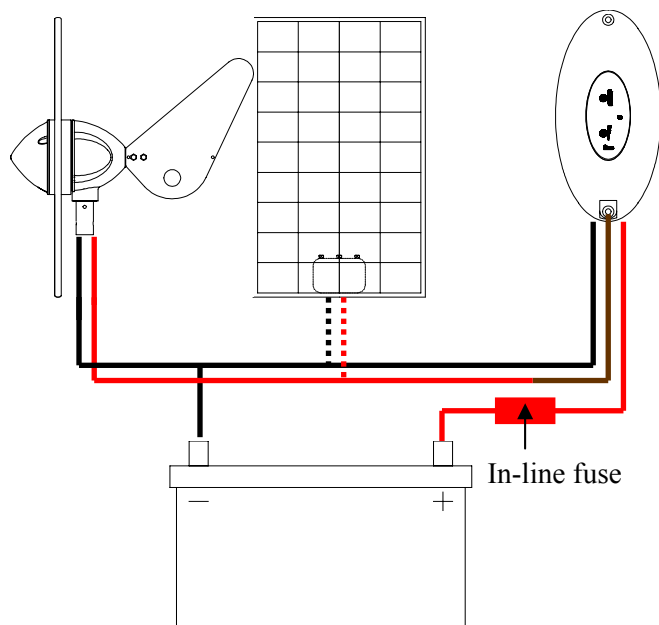


Fig 12  
**Rutland 504 & HRS503**  
**Regulator** with Solar Module  
 (max solar panel rating 80W. NB a diode must be fitted to the solar

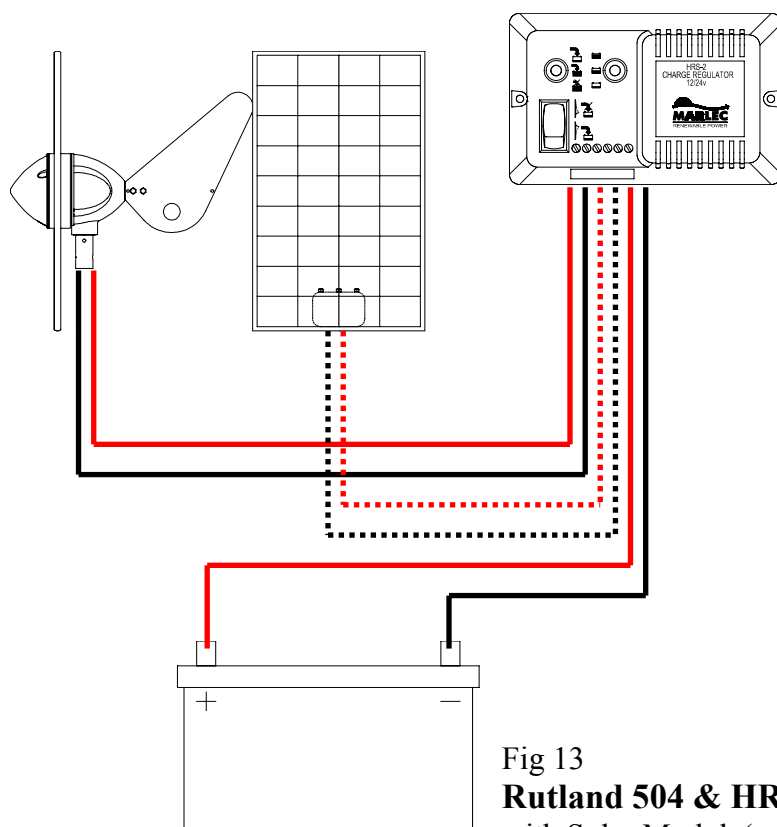


Fig 13  
**Rutland 504 & HRSi Regulator**  
 with Solar Module(max solar panel  
 rating 80W. NB a diode must be  
 fitted to the solar panel)

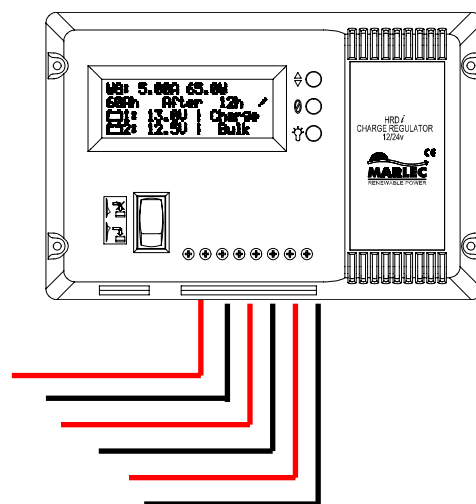


Fig 14  
**HRDi Controller Option**

## Up and Running

### Four Point Final Checklist

Before raising and securing the wind generator :

1. Check the tightness of tail fixing screws and generator mounting screws.
2. Check free rotation of the hub and yaw axis.
3. Check that the cable is not trapped.
4. Check that all electrical connections are secure and safe.

The wind generator can now be raised into position.

*Take care to avoid all moving parts when raising and lowering the wind generator.*

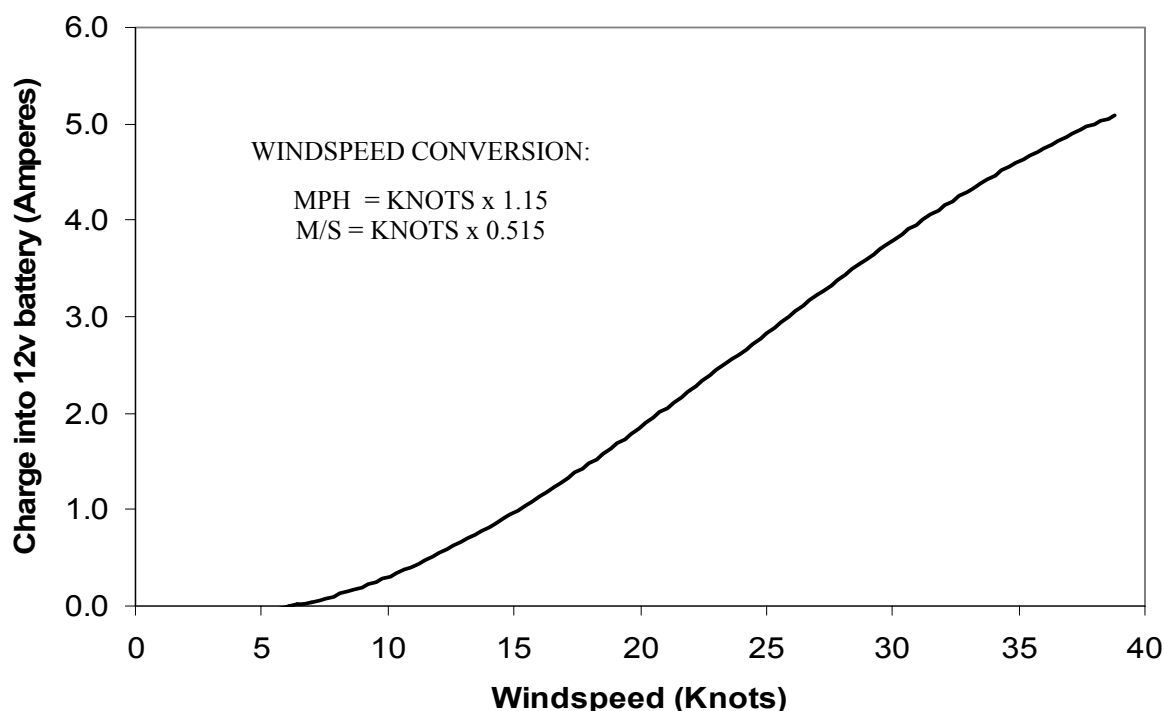
When raised, secure the structure firmly in an upright position.

*The performance of your Wind charger can be impaired if the pole is not vertical.*

## Specification and Performance

### Guideline Performance Curve

*Note : The curve shown below is for clear, non-turbulent wind conditions; this may not be achieved in some installations. Refer to the section on Siting to optimise performance at your site. Wind speeds are in situ of the Wind charger and may not reflect those measured at mast top or those reported by the Met. Office.*



## Maintenance and Troubleshooting

### Inspection and Maintenance

The Rutland 504 requires no scheduled maintenance but an annual inspection should be carried out to monitor the general condition of the system to ensure the electrical and mechanical integrity and safety of the system.

**WARNING!** Before inspection, the turbine should either be lowered to the ground or tied to prevent the generator from turning. To stop the generator from turning proceed as follows:

- Turn the wind generator out of the wind (180°) using the tail. A hole is provided in the tail fin to assist in this. The generator will eventually slow down.
- Tie a blade to the mounting pole to prevent it from rotating.

Whilst the generator is stationary, the following routine checks should be performed:

1. Check all nuts, bolts and screws for tightness.
2. Check the yaw axis for free rotation.
3. Check tower assembly for condition.
4. Check the tension of the guy wires if applicable. The tension of guy wires should be checked frequently during the first year.
5. The unit can be wiped with a mild detergent and rinsed with water to remove dirt and debris.

*Note : The Wind charger is designed for continuous running, this achieves maximum resistance to water ingress, should the unit be restrained for any extended period it is recommended that it be covered or removed to a dry location.*



## Trouble Shooting

In the unlikely event that your Rutland 504 should develop a defect, the turbine should first be tied to prevent the blades from turning to perform the static tests below. (Follow the procedure described in the Inspection and Maintenance section). It will be necessary to let it run for the tests to check for power production.

1. **Read the 12 Steps Quick Start Guide and Up and Running sections** and be satisfied that your system complies.
2. **Is there sufficient wind?** The Rutland 504 needs 5 knots wind speed to start charging. The wind speed across the turbine blades may be greatly reduced in a marina or built-up area compared with the reading on a masthead anemometer or weather reports.
3. Static Tests:
  - **Is the battery in good condition?** Check the voltage and electrolyte level of each battery.
  - **Check electrical continuity** throughout the system, especially corrosion and poor connections in cable joins and connector blocks.
4. Running Tests:
  - **Check for power output from the windcharger following this procedure:**
    - A Set a digital multi-meter to DC Amps, scale of up to 5A or less if possible. Connect the meter positive (+) probe to the wind gen output positive cable and the meter negative (-) to the regulator input positive. Provided there is sufficient wind there should be a current reading. This establishes that power is being delivered.
    - B Using the same multi-meter setting as above measure between the “regulator to battery” + and the battery +. Provided there is sufficient wind there should be a current reading. This establishes if power is passing through the regulator.
    - C If both above are unsuccessful set the multi-meter to DC Volts. Disconnect the wind generator from the regulator and connect the meter + to the wind gen + and the meter – to the wind gen -. Provided there is sufficient wind there should be a variable voltage reading according to the speed of the wind seen at the wind turbine. This will establish if the wind generator is able to deliver power or not.
    - D If tests A and C are successful but test B fails to produce results connect the wind gen directly to the battery. Set the digital multi-meter to DC Amps and measure power between the wind gen + and the battery +. If a reading is measured, providing there is sufficient wind, then the regulator is faulty.
    - E If the wind turbine fails to deliver any current or open circuit V reading undertake the further tests below.

5. Mechanical inspection. It may be necessary to remove the Wind charger from its pole for the following tests.

**A Check the brushes and slip ring for wear or damage.**

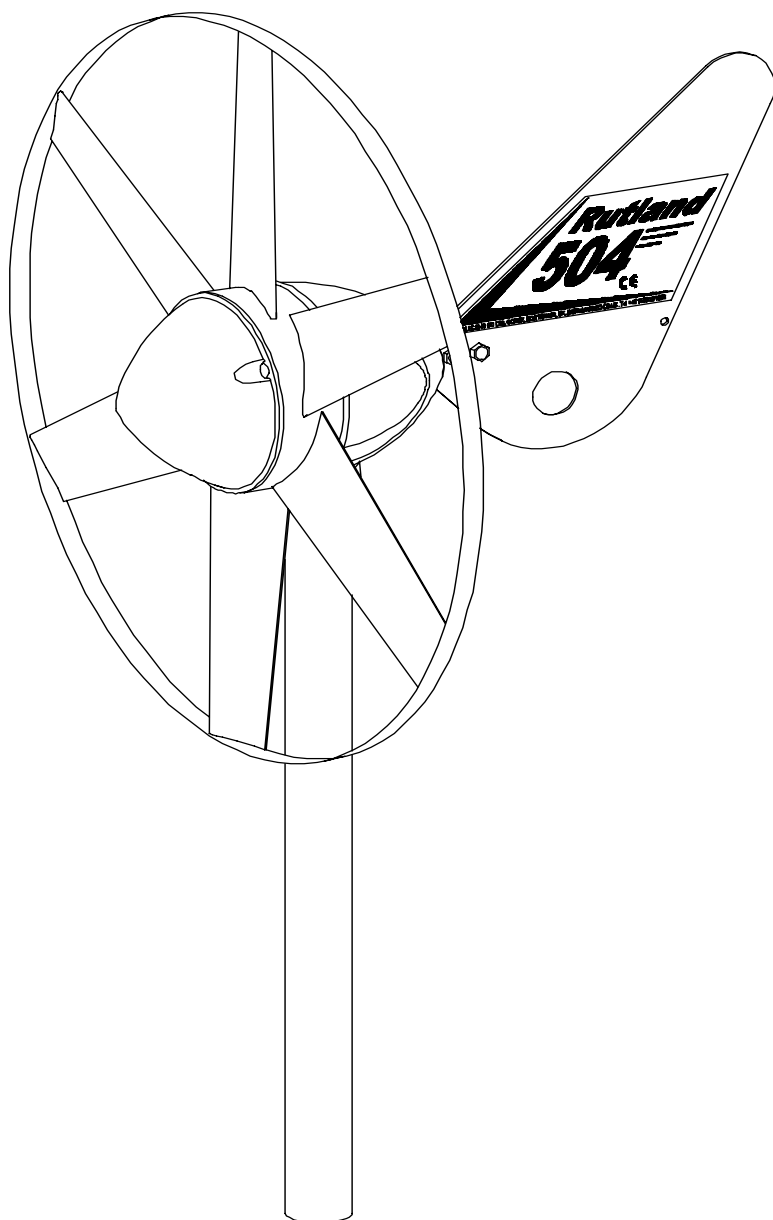
- To inspect the brushes, remove the tail fin and the plastic nacelle.
- The brushes can be inspected by removing the caps from the brush holders & withdrawing the brushes.
- Heavy deposits on the slipping and reduced power indicate a possible reverse connection to the battery. Clean the slipping with fine glass paper and fit new brushes.

**B Check hub for free rotation with generator disconnected from battery.**

- If the hub does not rotate freely, check for a possible short circuit in the wiring.
- If no wiring fault is found refer to your dealer or manufacturer.

If the above checks have identified a need for spare parts or failed to identify the problem you should contact Marlec who can advise you of your nearest distributor in their world wide network. In the first instance we recommend that you contact the company from whom the product was originally purchased.

**If in doubt, refer to your dealer or manufacturer.**



**For Your Records**

For your future reference we recommend you note the following:

**Serial Number:**

**Date of Purchase:**

**Date of Installation:**

**Type of Regulator:**

### **Limited Warranty**

**The Marlec Engineering Company Limited Warranty provides free replacement cover for all defects in parts and workmanship for 12 months from the date of purchase. Marlec's obligation in this respect is limited to replacing parts which have been promptly reported to the seller and are in the seller's opinion defective and are so found by Marlec upon inspection. A valid proof of purchase will be required if making a warranty claim.**

**Defective parts must be returned by prepaid post to the manufacturer Marlec Engineering Company Limited, Rutland House, Trevithick Road, Corby, Northamptonshire, NN17 5XY, England, or to an authorised Marlec agent.**

**This Warranty is void in the event of improper installation, owner neglect, misuse, damage caused by flying debris or natural disasters including lightning and hurricane force winds. This warranty does not extend to support posts, inverters, batteries or ancillary equipment not supplied by the manufacturer.**

**No responsibility is assumed for incidental damage. No responsibility is assumed for consequential damage. No responsibility is assumed for damage caused by the use of any unauthorised components.**

**No responsibility is assumed for use of a non "furling" versions of the Rutland Wind charger where Marlec or one of its authorised agents finds that a generator incorporating a furling device should have been used.**

**Manufactured in the UK by  
Marlec Engineering Co Ltd  
Rutland House,  
Trevithick Rd,  
Corby, Northants,  
NN17 5XY UK**

**Tel: +44 (0)1536 201588 Fax: +44 (0)1536 400211**

**Email: [sales@marlec.co.uk](mailto:sales@marlec.co.uk)**

**[www.marlec.co.uk](http://www.marlec.co.uk)**